We claim:

1. A method of controlling an effective coefficient of friction between a first surface of a first element and a second surface of a second element, the method comprising the steps of:
   a. configuring the first and second surfaces to be in slidable contact with one another along an interface between the first surface and the second surface and under a force sufficient to maintain contact and having a static friction therebetween; and
   b. inducing a repetitive motion in the first surface parallel to the interface thereby altering the effective coefficient of friction.
2. A method of controlling an effective coefficient of friction between a first surface of a first element and a second surface of a second element, the method comprising the steps of:
   a. configuring the first and second surfaces to be in slidable contact with one another along an interface between the first surface and the second surface and under a force sufficient to maintain contact and having a static friction therebetween; and
   b. inducing a symmetrical motion in the first surface parallel to the interface thereby altering the effective coefficient of friction.
3. The method according to claim 2 wherein the first element comprises a set of dimensions, the method further comprising the step of varying a desired dimension of the first element in response to an electronic signal.
4. The method as claimed in claim 3 wherein the step of varying the desired dimension further comprises providing a transducer having the set of dimensions, the transducer converting the electronic signal into microscopic mechanical displacements to generate the symmetrical motion.
5. The method according to claim 4 further comprising generating the electronic signal at a predetermined frequency which in turn varies the desired dimension at a corresponding velocity.
6. The method as claimed in claim 5 further comprising the step of amplifying the mechanical displacements.

7. The method as claimed in claim 6 wherein the step of amplifying further comprises producing a resonance in the transducer to amplify the mechanical displacements by an amplification factor proportional to a quality factor.

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8. The method as claimed in claim 7 wherein the step of producing the resonance further comprises the steps of:

   a. determining a longitudinal acoustic resonant frequency of the transducer along the desired dimension; and

   b. generating a frequency of motion in the transducer substantially equal to the resonant frequency.

9. The method as claimed in claim 5 further comprising the step of providing at least one extension member having an extension member body, the body being attached to the transducer.

10. The method as claimed in claim 9 further comprising the step of transferring the mechanical displacements to the extension member body.

11. The method as claimed in claim 10 further comprising the step of making the corresponding velocity proportional to a gain factor of the extension member body.

12. The method as claimed in claim 2 further comprising the step of temporally nulling a plurality of frictional forces generated by the symmetrical motion along the interface for at least one oscillation cycle by:

   a. maintaining the force to be constant for the cycle;

   b. adapting the surfaces to have an actual coefficient of friction substantially uniform along any slidable path; and

   c. providing the second element with a substantially large inertial mass.

13. The method as claimed in claim 2 further comprising the step of spatially nulling a plurality of frictional forces generated by the symmetrical motion along the interface by selecting the interface such that at least one frictional force from a region within the interface is opposed by at least one substantially equal and opposite frictional force from another region within the interface.

14. The method as claimed in claim 2 further comprising the step of reducing an actual

coefficient of friction between the first and second surfaces.

15. The method as claimed in claim 14 wherein the step of reducing the actual coefficient of friction further comprises adding a lubricant between the first and the second surfaces.

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16. The method as claimed in claim 14 wherein the step of reducing the actual coefficient of friction further comprises applying a thin film of material of a predetermined thickness to at least one of the surfaces.

17. The method as claimed in claim 16 further comprising the step of modifying the thin film by ion implantation of a predetermined number of ions/cm^2.

18. The method as claimed in claim 2 further comprising the step of minimizing bonding between the first and the second surface.

19. The method as claimed in claim 18 wherein the step of minimizing the bonding further comprises:

   a. polishing at least one surface to a predetermined degree of flatness per unit area;

   b. texturing at least one surface to form a series of microscopic recesses in accordance with a controlled and reproducible pattern; and

   c. coating at least one surface with an anti-bonding film.

20. The method as claimed in claim 18 wherein the step of minimizing the bonding further comprises:

   a. limiting a contact pressure between the first and the second surface to be less than 1 MPa;

   b. controlling each sliding surface to have a temperature between 0° C and 50° C;

   c. generating a frequency of the symmetrical motion of the first element in a range between 0 kHz and 120 kHz; and

   d. selecting the frequency of the symmetrical motion to be a longitudinal acoustic resonant frequency of the first element.

21. The method as claimed in claim 18 wherein the step of minimizing the bonding further comprises:

   a. selecting a melting temperature of a surface material for each of the surfaces to be substantially greater than 1000° C;

b. selecting a crystalline structure of the first surface to be substantially different than a crystalline structure of the second surface; and

c. selecting a thermal conductivity value of at least one surface to be large.

22. The method as claimed in claim 2 further comprising the steps of:

a. determining a root-mean-square velocity of the symmetrical motion of the first element as a function along the first surface;

b. determining a maximum root-mean-square velocity of the motion of the first element along the first surface; and

c. selecting a plurality of points in the first surface having the root-mean-square velocity within a predetermined percentage of the maximum root-mean-square velocity such that the selected points are configured to be in slidable contact with the second surface along the interface.

23. The method as claimed in claim 2 further comprising the step of initiating a sliding force to at least one element such that the first element and second element move at a translational speed relative to one another.

24. The method as claimed in claim 23 further comprising the step of controlling a root-mean-square velocity of the symmetrical motion in the first element to be greater than the translational speed between the elements.

25. The method as claimed in claim 2 further comprising the step of controlling a cross section of the first element to a predetermined specification.

26. The method as claimed in claim 2 further comprising the steps of

a. changing the force;

b. generating a signal representing the change in force wherein the signal is applied to a feedback mechanism; and

c. controlling a cross section of the first element in response to the signal from the feedback mechanism.

27. The method as claimed in claim 22 further comprising adapting one or more contact members to the first element at the selected points wherein the contact member is in slidable contact with the second surface along the interface.

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28. A method of controlling an effective coefficient of friction between a first surface of a first element and a second surface of a second element, the method comprising the steps of:

a. providing at least two contact points on the first surface;

b. configuring the contact points and the second surface to be in slidable contact with one another along an interface and under a force sufficient to maintain contact and having a static friction therebetween; and

c. energizing the first element to repetitively and alternately expand and contract a physical dimension of the first element such that the contact points move away from and toward one another at a determined velocity and parallel to the interface thereby adjusting the effective coefficient of friction.

29. The method according to claim 28 wherein no substantial translational motion is imparted to the second element by energizing the first element.

30. The method as claimed in claim 28 wherein the first element further comprises at least one transducer for converting electrical energy into microscopic mechanical displacements to generate the repetitive and alternative expansion and contraction at the determined velocity.

31. The method as claimed in claim 30 further comprising an excitation means for generating the electrical energy.

32. The method as claimed in claim 28 further comprising attaching at least one extension member to the first element, the extension member having an extension sliding surface and an extension member body with a variable cross section along a dimension of the extension member body.

33. The method as claimed in claim 32 further comprising the step of amplifying the repetitive and alternative expansion and contraction of the first element.

34. The method as claimed in claim 33 wherein the step of amplifying further comprises producing a resonance in the extension member, wherein the repetitive and alternative expansion and contraction is amplified by an amplification factor proportional to a quality factor of the extension member.

35. The method as claimed in claim 34 wherein the step of producing the resonance further comprises the steps of:

a. determining a longitudinal acoustic resonant frequency of the extension member along the dimension of the extension member body; and

b. generating a frequency of motion in the extension member substantially equal to the resonant frequency.

36. The method as claimed in claim 35 further comprising the step of transferring the amplified repetitive and alternative expansion and contraction of the first element to the extension sliding surface.

37. The method as claimed in claim 32 further comprising the step of making the determined velocity proportional to a gain factor of the extension member body.

38. The method as claimed in claim 28 further comprising the step of temporally nulling a plurality of frictional forces generated by the repetitive and alternative expansion and contraction of the first element along the interface for at least one oscillation cycle by:

a. maintaining the force to be constant for the cycle;

b. adapting the surfaces to have an actual coefficient of friction substantially uniform along any slidable path; and

c. providing the second element with a substantially large inertial mass.

39. The method as claimed in claim 28 further comprising the step of spatially nulling a plurality of frictional forces generated by the repetitive and alternative expansion and contraction of the first element along the interface by:

a. setting a frequency of the motion of the contact points;

b. setting a phase of the motion of the contact points;

c. setting an amplitude of the motion of the contact points;

d. adapting the surfaces to have an actual coefficient of friction substantially uniform along any slidable path; and

e. selecting a location of the contact points on the first surface such that at least one frictional force from a region within the interface is opposed by at least one substantially equal and opposite frictional force from another region within the

interface.

40. The method as claimed in claim 39 wherein the steps of setting the phase, frequency, and amplitude for the motion of the contact points further comprise:

   a. determining a common resonant frequency, an individual resonant phase, and an individual resonant amplitude for the motion of the contact points resulting from a substantially sinusoidal longitudinal acoustic resonant wave in the first element, whereby a propagation direction of the resonant wave is aligned substantially parallel to the first surface;

   b. setting the frequency of the motion to be the resonant frequency;

   c. setting the phase to the resonant phase for the point; and

   d. setting the amplitude to the resonant amplitude for the point.

41. The method as claimed in claim 28 further comprising the step of reducing an actual coefficient of friction between a contact point surface of the contact points and the second surface.

42. The method as claimed in claim 41 wherein the step of reducing the actual coefficient of friction further comprises adding a lubricant between the contact point surface and the second surface.

43. The method as claimed in claim 41 wherein the step of reducing the actual coefficient of friction further comprises applying a thin film of material of a predetermined thickness to at least one of the surfaces.

44. The method as claimed in claim 43 further comprising the step of modifying the thin film by ion implantation of a predetermined number of ions/cm^2.

45. The method as claimed in claim 28 further comprising the step of minimizing bonding between a contact point surface of the contact points and the second surface.

46. The method as claimed in claim 45 wherein the step of minimizing the bonding further comprises:

   a. polishing the surfaces to a predetermined degree of flatness per unit area;

   b. texturing the surfaces to form a series of microscopic recesses in accordance with a controlled and reproducible pattern; and

c. coating the surfaces with an anti-bonding film.

47. The method as claimed in claim 45 wherein the step of minimizing the bonding further comprises:

a. limiting a contact pressure between the contact point surface and the second surface to be less than 1 MPa;

b. controlling the contact point surface and the second surface to have a temperature between 0° C and 50° C;

c. generating a frequency of the repetitive and alternative expansion and contraction of the first element to be in a range between 0 kHz and 120 kHz; and

d. selecting the frequency of the repetitive and alternative expansion and contraction of the first element to be a longitudinal acoustic resonant frequency.

48. The method as claimed in claim 45 wherein the step of minimizing the bonding further comprises:

a. selecting a melting temperature of a surface material for the second surface to be substantially greater than 1000° C;

b. selecting a crystalline structure of the contact point surface to be substantially different than a crystalline structure of the second surface; and

c. selecting a thermal conductivity value of at least one of the surfaces to be large.

49. The method as claimed in claim 28 wherein configuring the contact points further comprises the steps of:

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a. determining a root-mean-square velocity of the repetitive and alterative expansion and contraction of the first element as a function along the first surface;

b. determining a maximum root-mean-square velocity of the repetitive and alternative expansion and contraction of the first element along the first surface; and

c. placing the contact points to a portion of the first surface having the root-mean-square velocity within a predetermined percentage of the maximum root-mean-square velocity.

50. The method as claimed in claim 28 further comprising the step of initiating a sliding force

to at least one element such that the first element and second element move at a translational speed relative to one another.

51. The method as claimed in claim 50 further comprising controlling a root-mean-square velocity of the repetitive and alternative expansion and contraction of the first element to be greater than the translational speed between the elements.

52. The method as claimed in claim 28 further comprising the step of controlling a cross section of the first element to a predetermined specification.

53. The method as claimed in claim 28 further comprising the steps of:

a. changing the force;

b. generating a signal representing the change wherein the signal is applied to a feedback mechanism; and

c. controlling a cross section along the first element in response to the signal from the feedback mechanism.

54. An ultrastiff precision sonic bearing assembly, comprising of:

a. at least one load member having a load member mass, each load member having at least one load accepting surface and at least one load sliding surface;

b. at least one bearing element having at least one bearing support region and at least one bearing sliding surface;

c. the load sliding surface in slidable contact with the bearing sliding surface by a force, the surfaces in slidable contact along a slidable path relative to each other;

d. the sliding surfaces having a coefficient of friction therebetween; and

e. energizing means for generating a substantially oscillatory sliding motion in the bearing element, the motion having an oscillation path tangent with the slidable path for at least one interacting point between the load sliding and the bearing sliding surfaces.

55. The sonic bearing assembly of claim 54 further comprising:

a. the load accepting surface being juxtaposed to at least one other, the load accepting surface disposed to be oppositely facing the load sliding surface;

b. the bearing support region being juxtaposed to at least one other, the bearing

support region disposed to be oppositely facing the bearing sliding surface; and

c. the force being substantially constant, whereby the force maintains the sliding contact between the sliding surfaces.

56. The sonic bearing assembly of claim 54 wherein the load sliding surface has a load sliding surface topography, the load sliding surface topography is selected from the group consisting of planar, cylindrical, and spherical topographies.

57. The sonic bearing assembly of claim 56 wherein the bearing sliding surface has a bearing sliding surface topography, the bearing sliding surface topography complementing the load sliding surface topography.

58. The sonic bearing assembly of claim 54 wherein the load sliding surface has a surface material with predetermined surface material properties.

59. The sonic bearing assembly of claim 58 wherein the surface material is selected from the group consisting of diamond, diamond-like carbon materials, steel alloys, steel, cubic carbon nitrides, cubic boron nitrides, zirconium carbon nitrides, titanium carbon nitrides, titanium aluminum nitrides, aluminum alloys, aluminum, alumina, sapphire, W, Ni, Nb, Ti, Si, Zr, Cr, Hf, Y, oxides of Nb, oxides of Ti, oxides of Si, oxides of Zr, oxides of Cr, oxides of Hf, oxides of Y, carbides of W, carbides of Nb, carbides of Ti, carbides of Si, carbides of Zr, carbides of Cr, carbides of Ta, carbides of Hf, nitrides of Ti, nitrides of Si, nitrides of B, nitrides of Zr, borides of W, borides of Zr, borides of Ti, borides of Hf, borides of Cr, PTFE polymer, HDPE polymer, and UHMWPE polymer.

60. The sonic bearing assembly of claim 54 wherein the bearing sliding surface has a surface material with predetermined surface material properties.

61. The sonic bearing assembly of claim 60 wherein the surface material is selected from the group consisting of diamond, diamond like carbon materials, steel alloys, steel, cubic carbon nitrides, cubic boron nitrides, zirconium carbon nitrides, titanium carbon nitrides, titanium aluminum nitrides, aluminum alloys, aluminum, alumina, sapphire, W, Ni, Nb, Ti, Si, Zr, Cr, Hf, Y, oxides of Nb, oxides of Ti, oxides of Si, oxides of Zr, oxides of Cr, oxides of Hf, oxides of Y, carbides of W, carbides of Nb, carbides of Ti, carbides of Si, carbides of Zr, carbides of Cr, carbides of Ta, carbides of Hf, nitrides of Ti, nitrides of Si,

nitrides of B, nitrides of Zr, borides of W, borides of Zr, borides of Ti, borides of Hf, borides of Cr, PTFE polymer, HDPE polymer, and UHMWPE polymer.

62. The sonic bearing assembly of claim 58 wherein the surface material is a thin film with a predetermined thickness.

63. The sonic bearing assembly of claim 62 wherein the thin film is modified by ion implantation of a predetermined number of ions/cm^2, whereby the film is subjected to implantation of a depth greater than the thickness of the film.

64. The sonic bearing assembly of claim 60 wherein the surface material is a thin film with a predetermined thickness.

65. The sonic bearing assembly of claim 64 wherein the thin film is modified by ion implantation of a predetermined number of ions/cm^2, whereby the film is subjected to implantation of a depth greater than the thickness of the film.

66. The sonic bearing assembly of claim 54 wherein an actual coefficient of friction for at least two of the surfaces in slidable contact are substantially identical and substantially uniform along the slidable path.

67. The sonic bearing assembly of claim 54 wherein the load member further comprises at least one load guideway member.

68. The sonic bearing assembly of claim 67 wherein the load guideway member is attached to the load member by an adhesive means.

69. The sonic bearing assembly of claim 54 wherein at least one of the bearing element further comprises at least one contact pad member having a contact pad surface.

70. The sonic bearing assembly of claim 69 wherein the contact pad member is attached to the bearing element by an adhesive means.

71. The sonic bearing assembly of claim 69 wherein the contact pad member has a pad inertial mass which is substantially smaller than a mass of the bearing element.

72. The sonic bearing assembly of claim 54 wherein a frequency of the oscillatory sliding motion in the bearing element is substantially equivalent to an operating frequency of a substantially longitudinal acoustic resonant wave, such that a propagation direction of the wave is aligned substantially parallel to the bearing sliding surface to produce a resonance

in the bearing element along the propagation direction.

73. The sonic bearing assembly of claim 72 wherein the bearing support region is located near a nodal region of the bearing element.

74. The sonic bearing assembly of claim 54 wherein the bearing element further comprises at least one extension member having:

a. an extension member body; and

b. a plurality of extension member faces, wherein at least one of the extension member faces is an extension attachment face.

75. The sonic bearing assembly of claim 74 wherein the extension member body has a substantially parallelepiped bar shape.

76. The sonic bearing assembly of claim 74 wherein the extension member further comprises a horn shape including:

a. an input face having an input surface area;

b. an output face having an output surface area; and

c. the input surface area being larger than the output surface area.

77. The sonic bearing assembly of claim 74 wherein at least one of the extension member faces is the bearing sliding surface.

78. The sonic bearing assembly of claim 74 wherein the extension member body further comprises a material selected from the group consisting of diamond, diamond like carbon materials, piezoelectric materials, magnetostrictive materials, steel alloys, steel, cubic carbon nitrides, cubic boron nitrides, zirconium carbon nitrides, titanium carbon nitrides, titanium aluminum nitrides, aluminum alloys, aluminum, alumina, sapphire, W, Ni, Nb, Ti, Si, Zr, Cr, Hf, Y, oxides of Nb, oxides of Ti, oxides of Si, oxides of Zr, oxides of Cr, oxides of Hf, oxides of Y, carbides of W, carbides of Nb, carbides of Ti, carbides of Si, carbides of Zr, carbides of Cr, carbides of Ta, carbides of Hf, nitrides of Ti, nitrides of Si, nitrides of B, nitrides of Zr, borides of W, borides of Zr, borides of Ti, borides of Hf, borides of Cr, PTFE polymer, HDPE polymer, and UHMWPE polymer.

79. The sonic bearing assembly of claim 74 wherein the extension member body has at least one controllable dimension for selecting an operating frequency of a longitudinal acoustic

resonant wave therein.

80. The sonic bearing assembly of claim 79 wherein the controllable dimension is adapted to substantially select the operating frequency.

81. The sonic bearing assembly of claim 74 wherein the extension member body has at least one controllable dimension for maximizing an acoustic coupling efficiency to the energizing means for a longitudinal acoustic resonant wave therein.

82. The sonic bearing assembly of claim 54 wherein the bearing element is comprised of a substantially bar shaped parallelepiped transducer element including:

a. an upper surface;

b. a lower surface; and

c. a dimension parallel to the upper surface and lower surface.

83. The sonic bearing assembly of claim 82 wherein the transducer element has at least one controllable dimension for selecting a frequency of a longitudinal acoustic resonant wave therein.

84. The sonic bearing assembly of claim 82 wherein the transducer element comprises at least one transducer segment having a magnetostrictive material with at least one coil wound around a portion thereof, wherein the coil produces a magnetic field having a magnetic field direction aligned substantially parallel to the dimension of the transducer element.

85. The sonic bearing assembly of claim 82 wherein the transducer element further comprises:

a. at least one piezoelectric transducer having a piezoelectric material;

b. the piezoelectric transducer having an electric dipole moment direction in the piezoelectric material;

c. an upper transducer electrode located on the upper surface of the piezoelectric transducer;

d. a lower transducer electrode located on the lower surface of the piezoelectric transducer; and

e. the electrodes disposed perpendicular to the electric dipole moment direction such that the energizing means produces an electric field having an electric field

direction in the piezoelectric transducer such that the electric field direction is substantially aligned across the dimension of the transducer.

86. The sonic bearing assembly of claim 85 wherein the transducer element comprises a plurality of piezoelectric transducers coupled in succession, each having piezoelectric material properties.

87. The sonic bearing assembly of claim 86 wherein the electric dipole moment direction for one of the plurality of transducers is the same as the electric dipole moment direction for at least one other of the plurality.

88. The sonic bearing assembly of claim 86 wherein the electric field direction of at least one of the plurality of transducers is opposite to the electric dipole moment direction of another in the plurality.

89. The sonic bearing assembly of claim 86 wherein the electric field direction is opposite to the electric dipole moment direction.

90. The sonic bearing assembly of claim 54 further comprising a base member, the base member having:

a. at least one base platform region; and

b. at least one base sliding region in slidable contact with the bearing support region.

91. The sonic bearing assembly of claim 90 further comprising at least one contact pad member coupled with the base sliding region, wherein the contact pad member has a contact pad surface.

92. The sonic bearing assembly of claim 90 further comprising at least one contact pad member coupled with the bearing support region, wherein the contact pad member has a contact pad surface.

93. The sonic bearing assembly of claim 90 further comprising:

a. at least one contact pad member coupled with the base sliding region, wherein the contact pad member has a contact pad surface; and

b. at least one contact pad member coupled with the bearing support region, wherein the contact pad member has a contact pad surface, whereby the base sliding region contact pad surface and the bearing support region contact pad surface are in

slidable contact with one another.

94. The sonic bearing assembly of claim 90 wherein the base platform region is juxtaposed to another, the base platform region disposed to be oppositely facing the base sliding region.

95. The sonic bearing assembly of claim 90 wherein the base sliding region has a base sliding region topography, the base sliding region topography is selected from the group consisting of planar, cylindrical, and spherical topographies.

96. The sonic bearing assembly of claim 95 wherein the bearing support region has a bearing support region topography, the bearing support region topography complementing the topography of the base sliding region.

97. The sonic bearing assembly of claim 90 wherein the base sliding region has a surface material of predetermined surface material properties.

98. The sonic bearing assembly of claim 97 wherein the surface material is a thin film with a predetermined thickness.

99. The sonic bearing assembly of claim 98 wherein the thin film is modified by ion implantation of a predetermined number of ions/cm^2, whereby the film is subjected to implantation of a depth greater than the thickness of the film .

100. The sonic bearing assembly of claim 97 wherein the surface material is selected from the group consisting of diamond, diamond like carbon materials, steel alloys, steel, cubic carbon nitrides, cubic boron nitrides, zirconium carbon nitrides, titanium carbon nitrides, titanium aluminum nitrides, aluminum alloys, aluminum, alumina, sapphire, W, Ni, Nb, Ti, Si, Zr, Cr, Hf, Y, oxides of Nb, oxides of Ti, oxides of Si, oxides of Zr, oxides of Cr, oxides of Hf, oxides of Y, carbides of W, carbides of Nb, carbides of Ti, carbides of Si, carbides of Zr, carbides of Cr, carbides of Ta, carbides of Hf, nitrides of Ti, nitrides of Si, nitrides of B, nitrides of Zr, borides of W, borides of Zr, borides of Ti, borides of Hf, borides of Cr, PTFE polymer, HDPE polymer, and UHMWPE polymer.

101. The sonic bearing assembly of claim 90 wherein an actual coefficient of friction for at least two of the surfaces in slidable contact are substantially identical and substantially uniform along the slidable path.

102. The sonic bearing assembly of claim 90 wherein the base member further comprises a

piezoelectric transducer element.

103. The sonic bearing assembly of claim 90 wherein the base member further comprises a magnetostrictive transducer element.

104. The sonic bearing assembly of claim 90 wherein the base member further comprises at least one support member region disposed in the base sliding region.

105. The sonic bearing assembly of claim 104 further comprising at least one support member, the support member being attached between the bearing support region and the support member region by an adhesive means.

106. The sonic bearing assembly of claim 105 wherein the support member is comprised of a piezoelectric transducer element.

107. The sonic bearing assembly of claim 105 wherein the support member is comprised of a magnetostrictive transducer element.

108. The sonic bearing assembly of claim 105 wherein the support member is comprised of an insulator material.

109. The sonic bearing assembly of claim 54 further comprising a lubricant disposed on any of the sliding surfaces.

110. The sonic bearing assembly of claim 109 wherein the lubricant is selected from the group consisting of molybdenum disulfide, mineral oil, saponified oils, greases, and any combination thereof.

111. The sonic bearing assembly of claim 109 wherein the lubricant is contained within a cavity of a reservoir structure, the reservoir structure attached to the bearing assembly.

112. The sonic bearing assembly of claim 54 wherein the energizing means comprises at least one excitation driver.

113. The sonic bearing assembly of claim 112 wherein at least a portion of the excitation driver is contained within an electronics package.

114. The sonic bearing assembly of claim 54 further including a controlling means for controlling a root-mean-square velocity of the oscillatory sliding motion.

115. The sonic bearing assembly of claim 114 wherein at least a portion of the controlling means is contained within an electronics package.

116. The sonic bearing assembly of claim 54 further comprising a controlling means for controlling a cross section of the bearing element.

117. The sonic bearing assembly of claim 116 wherein at least a portion of the controlling means is contained within an electronics package.

118. The sonic bearing assembly of claim 54 further comprising a bias means for altering a dimension of the bearing element.

119. The sonic bearing assembly of claim 118 wherein at least a portion of the bias means is contained within an electronics package.

120. The sonic bearing assembly of claim 54 further comprising a sensing means for determining a magnitude of the force, wherein the force is normal to the bearing element.

121. The sonic bearing assembly of claim 120 wherein the sensing means generates a signal for representing the magnitude of the force.

122. The sonic bearing assembly of claim 120 wherein the sensing means further comprises a sensor for measuring a value for frictional power dissipation.

123. The sonic bearing assembly of claim 120 wherein the sensor is contained within at least a portion of the bearing element.

124. The sonic bearing assembly of claim 54 further comprising a controlling means for minimizing bonding between the sliding surfaces.

125. An ultrastiff sonic bearing assembly, comprising:

a. at least one load member having at least one load sliding surface;

b. at least one base member having at least one base sliding region;

c. at least one bearing element further comprising:

i. a bearing body having a variable static stiffness and a variable dynamic stiffness;

ii. a bearing sliding surface, the bearing sliding surface in continuous slidable contact with the load sliding surface by a force for sliding along any slidable path;

iii. a bearing support region disposed in contact with the base sliding region by the force;

d. energizing means for converting electrical energy into microscopic mechanical displacement in the bearing element, the displacement for inducing a substantially oscillatory sliding motion, having an oscillation path along any slidable path; and

e. a stiffness altering means for controlling the static and dynamic stiffness characteristics of the bearing assembly.

126. The sonic bearing assembly of claim 125 wherein the stiffness altering means is comprised of at least one force servo mechanism for maintaining a constant stiffness throughout the bearing assembly.

127. The sonic bearing assembly of claim 126 wherein at least a portion of the force servo mechanism is contained within an electronics package.

128. The sonic bearing assembly of claim 126 wherein the force servo mechanism further comprises a sensing means for determining a change in magnitude of the force.

129. The sonic bearing assembly of claim 128 wherein the sensing means generates a force output signal representing the magnitude.

130. The sonic bearing assembly of claim 129 further including a controlling means for controlling a cross section of the bearing element to a predetermined specification.

131. The sonic bearing assembly of claim 130 wherein a portion of the controlling means compares the force output signal with a reference level representing the predetermined specification.

132. A method of controlling an effective coefficient of friction between a first surface of a first element and a second surface of a second element, the method comprising the steps of:

a. providing a contact point on the first surface;

b. configuring the contact point and the second surface to be in slidable contact with one another along an interface and under a force sufficient to maintain contact and having a static friction therebetween;

c. energizing the first element to produce a repetitive motion of the contact point such that the effective coefficient of friction is altered; and

d. determining a change in applied power required for producing the motion as a

result of a variation in the force.

133. The method as claimed in claim 132 wherein the first element further comprises at least one transducer for converting electrical energy into microscopic mechanical displacement.

134. The method as claimed in claim 133 further including the step of utilizing an excitation means for generating the electrical energy.

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135. The method as claimed in claim 132 further including the step of controlling a root-mean-square velocity of the motion at a predetermined specification.

136. The method as claimed in claim 132 wherein the step of determining the change in applied power comprises:

a. determining an initial level of the applied power required for inducing the motion before the variation;

b. determining a final level of the applied power required for inducing the motion after the variation; and

c. calculating a difference between the final level and the initial level.

137. The method as claimed in claim 132 further including the step of generating a signal which represents the variation in the force, the signal being applied to an output device.

138. The method as claimed in claim 137 wherein the output device is a feedback mechanism.

139. The method as claimed in claim 132 further comprising a step of suppressing a plurality of side effects, wherein the side effects further comprise bond formation between the contact point and second surface that prevents relative movement therebetween.

140. The method as claimed in claim 132 further comprising a step of suppressing a plurality of side effects, wherein the side effects further comprise at least one translational force in-between the surfaces.

add A1 > add B1